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THE  
NEW YORK  
Steam Cable Towing Company.

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THE BELGIAN SYSTEM OF CABLE TOWING  
AS RELATING TO THE USE OF  
STEAM ON THE CANALS  
AND THE QUESTION OF CHEAP TRANSPORTATION.

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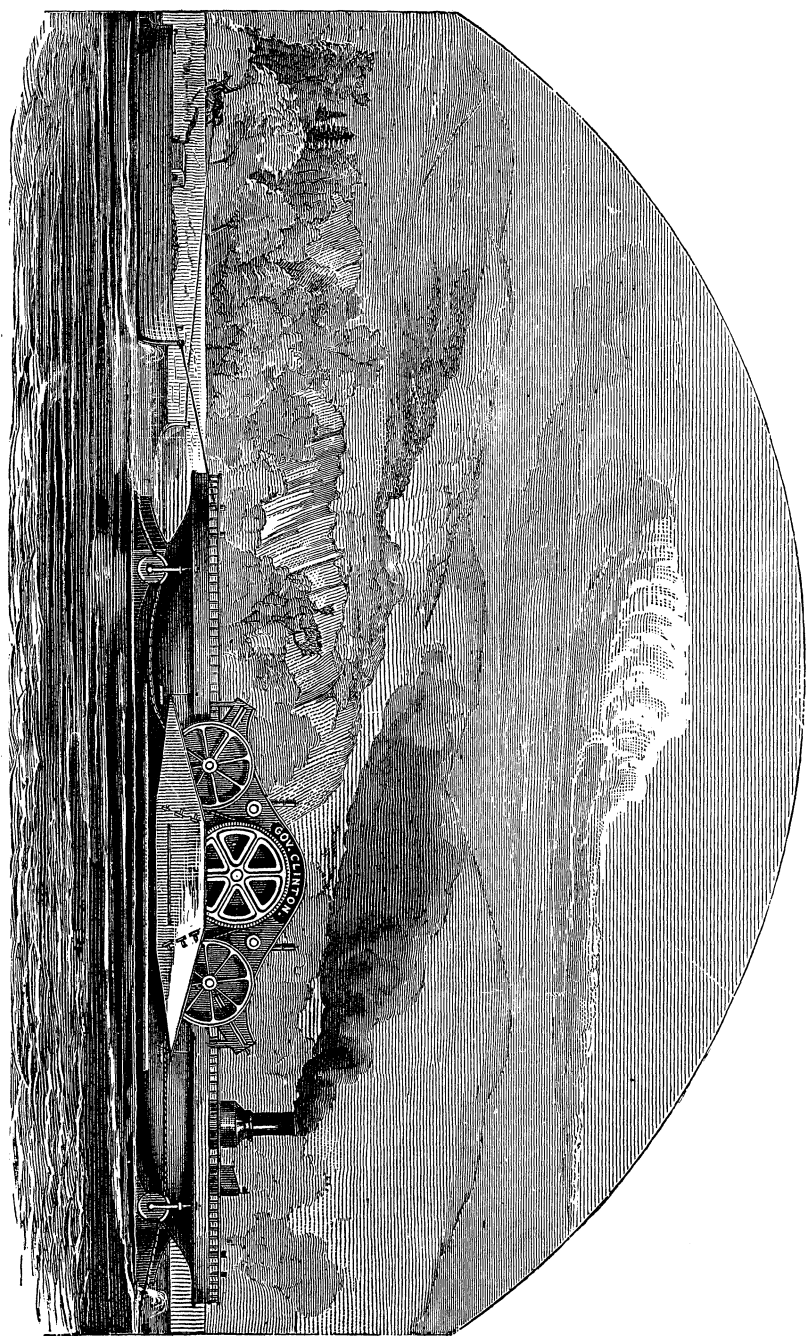
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ALBANY:  
WEED, PARSONS AND COMPANY, PRINTERS.  
1875.







[ *The cut on the opposite page is a representation of the tow-boats employed by this company in towing canal boats by means of a submerged cable and clip-drum.* ]

The system is simple, consisting of a wire cable laid on the bottom of the canal through its entire length, and fastened at the two extreme ends; and a steam tow-boat, provided with an additional engine, to which is attached a clip-drum, or grooved driving wheel, with suitable guiding and tightening pulleys. Thus equipped, and the boats to be towed made fast to the tow-boat, the process of towing is performed by lifting the cable from the bottom of the canal by means of a grapple, and placing it over the clip-drum. This drum is then put in motion (turned) by machinery in the tow-boat, causing the cable to pass over it without slipping, and fall back again into the canal at the stern of the tow-boat. Thus the tow-boat is drawn along the cable, and consequently through the canal, with the same facility that a locomotive is drawn on the rails, with this difference: the rail is stationary and the locomotive *wheel passes over it*, while the *cable* is flexible and *passes over the drum*. The tow-boats used, and the boats towed thereby, can be passed through the locks with the same facility as those towed by animal power. The immense commerce of the Erie canal will require two cables—one for the *up* and another for the *down* boats.



Although the article contained in this pamphlet was published two years ago, there is only a little change to be made in regard to details of operation, so as to include the whole season of 1876, in now using it as a reliable and conservative statement of the great benefits to the State and City of New York, and all interests connected with or relating to the Canal, resulting from the general introduction and use of the Belgian system.

It is very gratifying to those interested in the application of the Belgian system to the Erie Canal since the year 1871, that all merits heretofore claimed and estimates of profits to be made, have been confirmed as near as is possible, by the results of practical operations on a very limited scale.

EMERSON FOOTE.

New York, Feb. 1877.





## THE BELGIAN SYSTEM OF CABLE TOWING

AS RELATING TO THE USE OF STEAM ON THE CANALS AND THE  
QUESTION OF CHEAP TRANSPORTATION.

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The Belgian system of towing on rivers or canals by a steam-tug, working on a submerged chain or wire rope, has been in profitable operation on European rivers and canals for many years. The men who had successfully operated this system in Europe, visited this country, to introduce it on the great inland rivers and canals, but were unsuccessful, principally on account of their large demands for patent rights. In the year 1869, some Americans, who were very favorably impressed with their knowledge of the system, raised sufficient money to defray the expense of sending an agent to Belgium, to examine and test the working of the system and to introduce it upon the Erie canal, under a State charter, granting exclusive rights to use this system upon the canals of the State of New York. Their agent, being perfectly satisfied with his inspection and with the personal working of this system in Europe, purchased at Liege duplicate machinery of that he had operated, and, upon his return, constructed a boat after plans obtained from Belgium to contain it. Six miles of steel wire rope completed the required equipment, and, having been submerged on the canal from the Albany basin, through the locks, to Troy, the steam tug "Gov. Clinton" was most successfully worked upon the cable, and thus for the first time the Belgian system was introduced upon the Erie canal. This was in the year 1871.

The New York Steam Cable Towing Company was organized on the 1st day of November, 1871, to operate this system of steam towage upon the canals of this State, and, in an act to confer additional powers upon the company, passed March 8th, 1872, the State recognized the company as duly organized in conformity with the provisions of the law.

The company built that year another steam cable tower called the "M. M. Caleb," and, having purchased 26 miles more of steel wire rope, were enabled to equip the 31 miles of the Erie canal between Buffalo and Lockport with a single line of cable, and work thereon the two steam cable towers the company now owned. This portion of the canal was the most disadvantageous for the working of the Belgian system that can be found in the State. It was very crooked, included Tonawanda creek, which is full of sunken trees and rafts, and with an eastward current, between Buffalo and Black Rock, of from two to four miles the hour. This level was purposely selected to test the system under the greatest difficulties. From the season of canal navigation of the year 1871 up to that just closed of 1874, the Belgian system has been worked, for a whole or part of each season, in a perfectly satisfactory manner. No practical or mechanical difficulties now exist; it has the good will and patronage of the canal boatmen, and has never failed, after rigid investigation, to receive the indorsement of the many eminent men acquainted with the wants of the canal, or possessed of the best engineering, mechanical or financial abilities.

The following results have been obtained: Nine canal boats, or 1400 tons of freight, have been taken in one tow against the current at Black Rock. In all operations no limit of power has been developed. Machinery can be bought in England guaranteed to take 2000 tons of freight four miles the hour. A speed of three miles the hour is readily obtained, but all special tests at Buffalo have shown from four and one-half to six miles the hour, with 1000 tons of freight in tow, going against current. The expense of a cable tow-boat will not exceed \$30 for 24 hours. In 37 days 38 tons of coal were consumed. The tow-boat will cost about \$10,000. Last season the "M. M. Caleb" ran continuously 792 miles between Tonawanda and Buffalo, without an accident or delay of any kind, and no repairs of machinery or boat. An iron wire cable costs \$1,000 per mile, and at Cologne, where a ferry has for many years used this system, a one and one-eighth inch cable stands 15,000 passages. The daily expenses of the "M. M. Caleb," capable of towing 2500 tons of freight, are no more than the best steam self-propelling canal boat, carrying 200 tons of freight.

Canal boats towed by a cable towing boat four miles the hour, displace less water than when towed by animal power one and one-half miles the hour.

There is no wash to banks in cable towing, the only disturbance to the water being a wire rope, raised from the surface about twenty feet in advance of the boat, and the passage of the boat through the water.

Curves are easily rounded. The slack of the cable is readily managed. There are no kinks or breakages by use. The wire cable is spliced as readily as a hemp rope. The time in locking amounts to little as compared with the time saved by increased speed. For instance, it requires 65 hours to go by animal power from Rochester to Buffalo, 96 miles. There are only five locks, all at Lockport. The cable tow-boat will take five boats through in 30 hours, including any extra delay at locks, which at most will be to the last boat of the tow, 30 minutes. Here is a gain of 35 hours in only 96 miles of the canal.

The Belgian system is as readily used by the present canal boat as animal power. The steering gear must be altered to suit the increased speed, at an expense of \$20 and delay of 30 minutes. No trouble is experienced in passing canal boats.

No profits have been made with the two boats now owned by the company. The daily receipts have sometimes exceeded the daily expenses. Only such canal boats employed the cable tow-boats on the very short portion of the canal operated, as could do so with very great saving to their horses. But, when a single line of cable between Buffalo and Rochester can be operated with the necessary number of cable tow-boats, the company is promised the patronage of the owners of the present canal boats now using animal power. The profits must then be large, though the receipts be only what animal power now costs.

The very profitable results of cable towing in Europe is bringing it into more general use there. In the London newspaper, "Engineering," of June 19th, 1874, will be found a drawing and description of the "Leitha," working on the river Danube. A company at Cologne is working on the Rhine a distance of 250 miles, with a capital of 1,200,000 thalers.

The government of Belgium altered its canals at great expense, that this cable system of towing might be worked at greatest advantage, and after obtaining statistics of its very

profitable operation before the canals were adapted to it. Other instances of successful operation in Europe can be given.

Never before has the subject of steam on the canals assumed such great importance to the city and State of New York. The general stagnation of trade and the unusually severe competition of railways, have caused almost disastrous results to the individuals, or companies, doing the freighting business upon the Erie canal by means of animal power. The canal, during the past season, has been in remarkably good condition, as regards abundance and depth of water, and reduced power of current. The future of the business upon the canals looks very discouraging, as animal power is the sole reliance at present, and must continue to be, until some form of steam can be successfully and universally applied. Eminent railway officials prophesy the growing of grass in the canals, and this will be the case should there be a succession of unprofitable seasons like that just closed.

What has been done toward using steam on the canals?

For years, efforts have been made to accomplish this, and all of the usual forms of navigating water by steam, using the propeller or paddle, have been tried and abandoned. While admitting the enormous profit attending success, almost all have become skeptical upon the subject, and conclude that animal power, with enlarged locks and increased dimensions of canal, causing enormous outlay of money by the State, together with the abolition of tolls, to be the only remedies. The abolition of tolls — the State resorting to taxation for the maintenance of the canals — would be an immense help to the business.

The State, recognizing the necessity of applying steam to the canals, offered a prize of \$100,000 for a successful means of doing this. Proper and rigid provisions, demanded by the experience gained in ascertaining the wants of the business on the canal, were incorporated in the law. One system, the Belgian, was excluded from competition under the law, an amendment being added for the express purpose. The reasons for doing this were understood to be that it was not new, was the only feasible plan, and did not meet the object of the law, viz.: to stimulate the inventive talent of the people. Many efforts were made to comply with the law at large outlay of means,

but so unsuccessful were they, that very important changes in the provisions of the law had to be made, and the law was amended to meet the case. Under this fresh impetus old efforts were revived, and many new inventions created. The great object was, to carry 200 tons of freight in a steam canal boat at double the speed of, and cheaper than animal power. Many official trials were made, but none were successful, in the opinion of the eminent commission, appointed under the law to award the prize, and they so reported to the legislature. *There has been no award under that prize law.* The commission did recommend that a law be passed giving a donation to the two most meritorious competitors. This donation was to be awarded as follows: When one of the competitors had placed seven of his boats fully equipped upon the canal, he was to receive \$35,000, and under same conditions, the other competitor was to receive \$15,000 for three of his boats. This was the only way the State was to legally give money for steam on the canals. Since then, the two competitors have harmonized their interests, and, thus united, claim the award under the donation law recommended by the honorable commission, who could not award this \$50,000 under the original amended prize law.

But although it would seem as if the State prize law had been the means of nearly solving this question, yet among those men best qualified to judge of the practical success of these two boats, by reason of their business as produce merchants, as managers of transportation companies working on the canals, or as possessing great knowledge of machinery, there exists great doubt as to the unqualified success publicly claimed by the owners or inventors of these two boats. Have they really done any thing new? If they have made any profits, how do they compare with those of canal boats using animal power? How much money has each boat made? Have they paid expenses? What repairs have been necessitated by practical working? How do the boats rate upon the underwriters' books, and compare with other steam canal boats?

During the past season, a produce firm made a contract for a steam canal boat, to be built under rigid specifications, like those in the State prize law, as to power, carrying capacity, speed, and least expense, the pay for the boat to be forfeited

if it failed to meet the provisions of the contract. This boat was rejected. A member of this firm is probably the only merchant belonging to the New York Produce Exchange, who, from great interest in the question of steam on the canals, went on one of the boats from New York to Buffalo and back, that stood best in the estimation of the commissioners of the prize law. It is claimed that the boat his firm refused to pay for, on account of its complete failure, had better machinery than the best boats competing for the State prize.

The seriousness of the subject increases as success approaches. And should the present prize boats fail, a general abandonment of the subject would inevitably follow, as they are the best created by the great stimulus of the \$100,000 prize.

But it may be that the solution of this question will come from a rigid investigation of the merits of that system excluded by amendment from the provisions of the prize law. The engineer of the prize commission has made a most favorable report of this system, and, after liberally allowing for the few unfavorable features suggested by his examination of its operations on the canal between Buffalo and Lockport, comes to the conclusion "that the cost of movement proper (by this system), between Buffalo and New York, as compared with that by the present horse boat, is *thirty-six per cent less*," and better by eight to ten per cent than the two steam canal boats he especially favors. His qualifying remarks at the end of the report are not discouraging when the exceedingly exhaustive nature of the report is considered, covering fully all objections that suggested themselves to his able judgment while preparing it. It is said by competent and unprejudiced judges that it is the cheapest known form of applying steam power to shallow water, and the results, as they are shown in the engineer's report to the prize commission, seems to justify this.

A question of the greatest importance is, how to utilize the 5,000 canal boats, now doing the enormous business of the Erie canal, when steam is substituted for animal power. The owners of those boats, representing an investment of nearly \$20,000,000 of money, are unable, as a rule, to apply steam machinery to them, even was an approved form known of at the present time, for the additional cost would be equal to the present investment. These owners grant the necessity of some

power other than animal, and will gladly adopt it if practically and economically offered. This must at least be something that is as cheap as horse power, and, if possible, give the great benefits coming from increased speed. They, and all important judges of the wants of the canals and its business, see no relief in any, even the best, of the steam canal boats created by the prize law. The State commission confirm this by their report to the legislature, and their inability to award the State prize.

The efforts of the promoters of these new steam canal boats are entirely devoted to placing on the canal new boats of peculiar construction of hull and machinery, rather than applying machinery to the present horse canal boats, upon which the enormous trade now done annually upon the canals, solely depends.

But the most serious trouble arises from the almost ruinous rates of freight paid owners of canal boats during the past season, and if continued in future seasons, must result in the stoppage of all business on the canals now using animal power. It will be seen that no form of steam canal boat, restricting the application of its power to the 250 tons of cargo it carries, can remedy this present most serious aspect of canal transportation. It cannot be done as cheaply as animal power, though double speed be uniformly obtained. The solution can only come through some application of steam that will, at the same cost as animal power, move more tons. Large propellers cannot profitably be used in narrow inland water channels like canals — cannot be used at all until the Erie canal is enlarged. If the present steam canal boats, with the same cost, could carry 500 tons, then they would supersede animal power.

The aim of all efforts to introduce steam on the canals, is to cheapen transportation, and increase the tonnage annually moved between the West and the Atlantic. The best means of transportation is by the lakes, Erie canal, and Hudson river. No other plan is as capacious, feasible and cheap, and the present commercial supremacy of New York city cannot pass to other seaboard cities, if the present carrying capacity of the Erie canal can be developed. Although an average of 6,000,000 of tons of freight are transported on the canal every season, yet its present capacity, based upon double locks and



a lockage of four minutes, is estimated by the State engineer to be over 18,000,000 of tons. On the Delaware and Hudson canal, modern drop gates are used at the locks, and lockages are made in two minutes. This improvement, applied to the Erie canal, would make its capacity 36,000,000 of tons, which is equal to any demands of trade. The solution of the question of cheap transportation rests as much upon the increased amount of freight transported, as upon increased speed obtained. If double the present tonnage is transported at present speed and cost of animal power, a great gain results. Increased tonnage diminishes cost of transportation. For instance, the tolls on double the present tonnage could be one-half what they now are, and the State receive the same amount of revenue. This would reduce the freight one and one-half cents on a bushel of wheat. Increased speed increases this great gain, according to its relation to the present speed by animal power, by which 6,000,000 of tons are now moved in a season. The perfect solution of the question of cheap transportation is reached when the extreme capacity of the Erie canal is utilized, and the means which nearest accomplishes this is the best, and regulates the business of the canal by simple laws of trade. What, then, is the best, cheapest, and quickest way to develop this enormous capacity of the Erie canal? Improved gates, enlarged locks or dimensions of canal, while increasing the capacity, only increase the present difficulties. Some new means of transporting freight must be found. The best steam canal boats are inadequate to do this. The increased speed claimed for them would be neutralized, when the 5,000 canal boats have had steam applied to them, on account of the consequent increased risks of collision. A direct railroad from the west to the Atlantic, without grades, constructed in the most substantial manner, transporting freight at the most economical rate of speed, cannot cheapen transportation to the extent afforded by the lakes and Erie canal. On the best managed railroads, between the west and seaboard, freight is not now transported at a less cost to the railroad company than one cent per ton a mile. Some years hence, it is claimed, the cost will be reduced as low as six-tenths of a cent a ton a mile, at a speed not to exceed six miles the hour. This makes the freight on a ton of wheat from Chicago to New York, cost about \$5.50. When the present

capacity of the Erie canal is utilized, a ton of wheat can be taken by lakes and canal from Chicago to New York at about \$4.00, and pay a profit. Increased speed and power upon the Erie canal, at a cost that admits of its substitution for animal power, will meet all demands of cheap transportation. The Belgian system does this, as the foregoing facts prove, and as its application to the Erie canal approaches perfection, the minimum cost of transportation will be reached. The speed, with 2,500 tons in tow, may exceed six miles an hour; the power is limited only to the size of the cable and capacity of engine. Any new motor can be adapted, but no improvement or invention other than this, develops such positive connection and complete utilization of power between the boat moved and the water that floats it.

What, then, prevents the realization of these great advantages to State, city and individual from cheap transportation? Only the money — not exceeding \$300,000 — and in a way that combines simplicity, safety and great profit. Compare this amount with any scheme publicly presented. The canals are taken as they are, saving proposed enlargement at immense cost. No money or legislation is wanted from the State. The company's charter is ample for present or future wants. The system is strongly supported by all canal men, and the most imperative demands are made by them for the equipment of the canal by the opening of navigation in the spring. Financially, it must be a success. Any form of steam that is substituted for animal power possesses a virtual lease of the canal. The business awaiting is determined by State statistics. The receipts, based upon a charge for towing that is the same as present cost of animal power, can be accurately estimated. The boatmen promise to pay such charge, they receiving the benefit of double speed at least, which doubles the season's trips and largely increases their income. The actual expenses are known, and the number of cable tow-boats required to tow the canal boats, now the sole reliance of the vast business coming to and greatly benefiting the merchants and real estate owners of the city of New York.



## APPENDIX.

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Copy of the law authorizing the employment of this system of towage upon the canals of the State of New York.

### CHAPTER 576, LAWS OF 1870.

AN ACT to provide for the introduction of the European system of steam towage upon the canals of this State.

PASSED May 2, 1870; three-fifths being present.

*The People of the State of New York, represented in Senate and Assembly, do enact as follows:*

SECTION 1. Permission is hereby granted to ADDISON M. FARWELL, of Watertown, New York, his associates and successors, who may organize a corporation under the act entitled "An act to authorize the formation of corporations for manufacturing, mining, mechanical and chemical purposes," passed February seventeen, eighteen hundred and forty-eight, and any act or acts amendatory thereof, to introduce upon the canals of this State the "European system" of steam towing.

§ 2. The said FARWELL, his associates and successors, who shall organize as provided in previous section, are hereby authorized and empowered to tow boats, floats and cargoes on the canals of this State, for hire, and for that purpose may purchase and construct, or cause to be constructed, the necessary appliances for carrying on the business of canal towing, under the said European method, and shall have the exclusive right and privilege, during the term for which said corporation may be organized, to submerge or place one or more chains or cables on the bottom of the canals of this State, and attach the same thereto in such manner as will not interfere with navigation; and shall have the exclusive right to use such submerged chains and cables, designated and known as the European system, in the prosecution of the peculiar method of towing thereby. And whenever and wherever it may be necessary so to do, the said FARWELL, his associates and successors, or corporation aforesaid, are hereby authorized and empowered to own and employ other motive

